

EXHIBIT A

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: LIAO, Heng; NICHOLS, Stacy; LITTLE, Vernon, R.; HUSCROFT, Kevin
Serial No.: 10/771,268
Filed: February 3, 2004
Title: METHOD AND APPARATUS FOR PACKET GROOMING AND AGGREGATION
Group: 2665
Examiner: TRAN, Tung Q
Attorney Ref.: PAT 2241-2 US

October 15, 2007

Mail Stop **AMENDMENT**
Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia
22314-1450
U.S.A.

Dear Sir:

RESPONSE UNDER 37 C.F.R. 1.111

This is in response to the outstanding Office Action dated July 13, 2007.

Amendments to the Claims begin on page 2 of this document.

Remarks/Arguments begin on page 6 of this document.

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of the claims in the application.

Listing of Claims

1. (currently amended) A method of packet grooming and aggregation within an Ethernet over SONET/SDH system (EOS system), said method comprising:

~~delivering efficient bandwidth per data stream; and~~
receiving data packets each tagged according to an encapsulation scheme and
including a port or channel ID;
 multiplexing a number of data streams according to respective tags, port or channel
IDs of said data packets; and

mapping each said data stream directly to a physical transport interface by tag
modification independent of any Layer 2 bridging or Layer 3 routing protocol.

2. (currently amended) The method as claimed in claim 1 wherein,

said multiplexing and mapping step is ~~flexible in that service flow is defined~~
independent of any given physical Ethernet port or ~~Sonet~~ SONET/SDH virtual concatenation
groups (VCG) transport pipes so as to allow flexible multiplexing and mapping of said ~~service~~
~~flow~~ number of data streams among said physical Ethernet ports and SONET/SDH VCG
transport pipes and to guarantee quality of service levels of ~~service flow during said flexible~~
mapping flow of said number of data streams.

3. (canceled)

4. (currently amended) An Aggregation/Grooming Engine (AGE) for use within an Ethernet over SONET/SDH system (EOS system), said AGE comprising:

an ingress portion having
an ingress header unit for receiving data from an Ethernet MAC subsystem
and extracting 2-tuple ingress search keys including a port or channel ID and an ingress frame
tag, wherein said ingress frame tag is according to an ingress frame tag encapsulation
scheme;

an ingress lookup engine including a corresponding ingress flow database and coupled to said ingress header unit;

an ingress tag editor coupled to said ingress lookup engine; and

an ingress flow FIFO unit coupled to said ingress tag editor and an encapsulation engine; and
an egress portion having

an egress header unit for receiving data from said encapsulation engine and extracting 2-tuple ingress search keys including a virtual concatenation group ID and an egress frame tag, wherein said egress frame tag is according to an egress frame tag encapsulation scheme;

an egress lookup engine including a corresponding egress flow database and coupled to said egress header unit;

an egress tag editor coupled to said egress lookup engine; and

an egress flow FIFO unit coupled to said egress tag editor and said Ethernet MAC subsystem;

wherein said ingress portion and said egress portion of said AGE provide grooming and aggregation functionality for said EOS system including label lookup, flow buffering, label editing, and flow scheduling.

5. (original) The AGE as claimed in claim 4 wherein said ingress flow FIFO unit and said egress flow FIFO unit are multi-channel FIFOs where each buffers respective data flow for one service flow.

6. (canceled)

7. (original) The AGE as claimed in claim 4 wherein said ingress portion and said egress portion form symmetric ingress and egress paths.

8. (original) The AGE as claimed in claim 4 wherein said ingress lookup engine and said egress lookup engine are integrated into a single bi-directional lookup engine having a corresponding bi-directional flow database that integrates said ingress flow database and said egress flow database.

9. (currently amended) A method of packet grooming and aggregation within an Ethernet over SONET/SDH system (EOS system), said method comprising:

receiving a data packet tagged according to an encapsulation scheme and including a port or channel ID;

providing an input client frame from said data packet to a header unit;

extracting a search key including said port or channel ID and said tag from said input client frame via said header unit;

correlating said search key via a lookup engine to a match in a flow database to determine flow context;

modifying said input frame via a tag editor according to said flow context;

buffering said input client frame via a flow FIFO;

applying ~~appropriate~~ discard policies to said flow FIFO based on said flow context;

and

scheduling said input client frame via a scheduler of the flow FIFO for transmission into output channels according to output channel status and flow quality of service parameters.

10. (currently amended) The method of packet grooming and aggregation as claimed in claim 9 wherein said scheduling step occurs in accordance with ~~an AGE flow database~~ said flow context.

11. (currently amended) The method of packet grooming and aggregation as claimed in claim 10 further including the steps of:

receiving said search key,

performing a wildcard linear search against predetermined search key fields of said ~~AGE~~ flow database,

fetching flow context from said AGE flow database, and

outputting said flow context.

12. (original) The method of packet grooming and aggregation as claimed in claim 9 wherein said correlating step occurs in accordance with a combined ingress table and egress table in a bi-directional lookup manner.

13. (currently amended) The method of packet grooming and aggregation as claimed in claim 12 further including the steps of:

- receiving said search key,
- upon determining an ingress lookup,
 - performing a first wildcard linear search of said search key against predetermined ingress flow fields of a bi-directional flow database,
 - fetching flow context from said egress flow fields of said bi-directional flow database,
- upon determining an egress lookup,
 - performing a second wildcard linear search of said search key against predetermined egress flow fields of a bi-directional flow database,
 - fetching flow context from said egress flow fields of said bi-directional flow database,
- modifying a portion of said egress flow fields according to predetermined rules,
- and
- outputting said flow context.

14. (new) The AGE as claimed in claim 4 wherein said ingress frame tag is an 802.1Q tag, a MPLS tag, or a proprietary tag.

15. (new) The AGE as claimed in claim 4 wherein said egress frame tag is an 802.1Q tag, a MPLS tag, a proprietary tag, or a GFP tag.

Remarks

Claims 1, 2, 4, 5, 7 to 15 are pending in this application. Claims 1, 2, 4, 9 to 11, and 13 have been amended to more clearly define the claimed subject matter. Claim 3 has been withdrawn as being directed to a non-elected group. Claim 6 has been cancelled. Claims 14 and 15 are new.

Election/Restriction

In response to the Examiner's election requirement, claim 3 has been cancelled from this application as being directed to a non-elected group.

Claim Rejections under 35 USC § 112

In response to the Examiner's rejection to claim 6, Applicants have cancelled claim 6.

The Examiner rejected claim 9 stating that the phrase "appropriate discard policies" is unclear. In response, Applicants have amended claim 9 to recite, "applying discard policies to said flow FIFO based on said flow context." It is now clear that the discard policies are applied to the flow FIFO based on the flow context. Applicants submit that this amendment is fully supported by the original specification at least in paragraph [0074].

The Examiner rejected claim 10 as being unclear. The Examiner states that the limitation "said scheduling step occurs in accordance with an AGE flow database" is not supported by the specification. In response, Applicants have amended claim 10 to recite, "said scheduling step occurs in accordance with said flow context." Support for this amendment exists at least in paragraph [0084] of the original specification.

In response, to the Examiner's rejection to claim 11, Applicants have amended the term "flow context" in the last line of claim 11 to recite "said flow context". A similar amendment has been made to claim 13.

Applicants submit that the amended claims submitted herewith distinctly define the claimed subject matter and are in compliance with 35 USC § 112. Withdrawal of the rejections to claims 9 to 13 is respectfully requested.

Claim Rejections under 35 USC § 102

The Examiner has rejected claims 1 and 2 as being anticipated by U.S. Patent No. 6,946,519 to Russell. In response, Applicants have amended claims 1 and 2 to clearly define the claimed subject matter. The amendments are fully supported by the original specification and drawings. Applicants submit that Russell does not anticipate amended claims 1 and 2 for at least the following reasons.

Amended claim 1 recites (emphasis added):

A method of packet grooming and aggregation within an Ethernet over SONET/SDH system (EOS system), said method comprising:
receiving data packets each tagged according to an encapsulation scheme and including a port or channel ID;
multiplexing a number of data streams according to respective tags, port or channel IDs of said data packets; and
mapping each said data stream directly to a physical transport interface by tag modification independent of any Layer 2 bridging or Layer 3 routing protocol.

Russell provides one-to-one mapping from Ethernet port to SONET virtual container without grooming or aggregation, or any kind of multiplexing or encapsulation function. In particular, Russell specifically teaches that “frame based data is incorporated directly into a synchronous virtual container without encapsulation in an intermediate protocol” (emphasis added) (see abstract). Russell does not teach or suggest a method of packet grooming and aggregation based on data packets tagged according to an encapsulation scheme and multiplexing a number of data streams according to respective tags and port or channel IDs of the data packets. Furthermore, Russell does not teach mapping the data streams directly to a physical

transport interface by tag modification independent of any Layer 2 bridging or Layer 3 routing protocol. Therefore, Russell does not anticipate amended claim 1.

Claim 2 depends from claim 1 and includes all limitations thereof. For at least the reasons that claim 1 is not anticipated by Russell, claim 2 is also not anticipated. Applicants submit that amended claims 1 and 2 are novel and respectfully request withdrawal of the rejections under 35 US § 102.

Claim Rejections under 35 USC § 103

The Examiner has rejected claims 4, 5, 7, and 8 as being unpatentable over U.S. Patent No. 6,222,848 to Hayward in view of U.S. Patent Publication No. 2005/0025469 to Greer et al. In response, Applicants have amended claim 4 and submit that claims 4, 5, 7 and 8 are patentable for at least the following reasons.

Amended claim 4 recites (emphasis added):

An Aggregation/Grooming Engine (AGE) for use within an Ethernet over SONET/SDH system (EOS system), said AGE comprising:
an ingress portion having
an ingress header unit for receiving data from an Ethernet MAC subsystem and extracting 2-tuple ingress search keys including a port or channel ID and an ingress frame tag, wherein said ingress frame tag is according to an ingress frame tag encapsulation scheme;
an ingress lookup engine including a corresponding ingress flow database and coupled to said ingress header unit;
an ingress tag editor coupled to said ingress lookup engine; and
an ingress flow FIFO unit coupled to said ingress tag editor and an encapsulation engine; and
an egress portion having
an egress header unit for receiving data from said encapsulation engine and extracting 2-tuple ingress search

keys including a virtual concatenation group ID and an egress frame tag, wherein said egress frame tag is according to an egress frame tag encapsulation scheme;

an egress lookup engine including a corresponding egress flow database and coupled to said egress header unit;

an egress tag editor coupled to said egress lookup engine; and

an egress flow FIFO unit coupled to said egress tag editor and said Ethernet MAC subsystem;

wherein said ingress portion and said egress portion of said AGE provide grooming and aggregation functionality for said EOS system including label lookup, flow buffering, label editing, and flow scheduling.

Hayward describes a routing system between Ethernet ports and SONET containers. The system of Hayward is a prior art system known to persons skilled in the art and is described in detail as a L2/L3 switching system at paragraph [0019] of the original specification. The limitations of an L2/L3 switching systems such as that of Hayward are well documented in the original specification. In particular, in L2/L3 switching systems, the routing/bridging function utilizes the destination address as the key for associated table lookup and to determine which direction a packet would go. The packet distributor 214 in Hayward performs this function (see column 6, lines 13-14; column 7, lines 22-65; nad column 8, lines 19-48).

In contrast, the AGE as claimed uses the 2-tuple ingress and egress search keys including a channel or port ID and a tag for searching the respective flow database without the use of packet address (such as MAC or IP address) and the associated address association table as taught by Hayward. As enunciated in the original specification in paragraph [0022] and [0023], management of the address association table is difficult owing, among others, to complex network management, security, and scalability issues. In addition, using MAC or IP address and the address association table requires the building of L2 or L3 network, routing protocol, and/or bridging protocol. The AGE as defined by amended claim 4 avoids such complexity by using a 2-tuple search key.

Applicants submit that neither Hayward nor Greer teach or suggest, either alone or in combination, an AGE as defined by amended claim 4. Therefore, claim 4, as amended, is not only novel, but also inventive over the cited prior art.

Claims 5, 7 and 8 depend directly or indirectly from amended claim 4 and include all limitations thereof. For at least the reasons that amended claim 4 is novel and non-obvious, claims 5, 7 and 8 are also novel and inventive. Applicants submit that amended claims 4, 5, 7 and 8 are novel and non-obvious, and respectfully request withdrawal of the rejections under 35 US § 103.

The Examiner's rejection to claim 6 has been rendered moot as claim 6 has been cancelled.

The Examiner has rejected claims 9 and 12 as being unpatentable over Hayward in view of U.S. Patent Publication No. 2002/0191543 to Buskirk. In response, Applicants have amended claim 9 along the lines of the amendments to claim 4. Specifically, amended claim 9 recites, among others, "receiving a data packet tagged according to an encapsulation scheme and including a port or channel ID;" and "extracting a search key including said port or channel ID and said tag from said input client frame via said header unit" (emphasis added).

Hayward or Buskirk do not teach or suggest, either alone or in combination, a method of packet grooming and aggregation within an Ethernet over SONET/SDH system (EOS system) as defined by amended claim 9. In particular, the steps of "receiving a data packet tagged according to an encapsulation scheme and including a port or channel ID" and "extracting a search key including said port or channel ID and said tag from said input client frame via said header unit" are not disclosed by either Hayward or Buskirk.

For at least the reasons stated above and the arguments presented in favor of amended claim 4, amended claim 9 is novel and inventive over the cited prior art. Claim 12 depends from claim 9 and, therefore, is also novel and inventive over the cited prior art. Applicants respectfully request withdrawal of the rejections to claims 9 and 12 under 35 US § 103.

No fee is believed due for this submission. However, Applicant authorizes the Commissioner to debit any required fee from Deposit Account No. 501593, in the name of Borden Ladner Gervais LLP. The Commissioner is further authorized to debit any additional amount required, and to credit any overpayment to the above-noted deposit account.

Respectfully submitted,

LIAO, Heng et al.

By: /Mukundan Chakrapani/
Mukundan Chakrapani
Reg. No. 60,879
Borden Ladner Gervais LLP
World Exchange Plaza
100 Queen Street, Suite 1100
Ottawa, ON K1P 1J9
CANADA
Tel: (613) 237-5160
Fax: (613) 787-3558
E-mail: ipinfo@blgcanada.com

MC/dbm